TECHNICAL DRAFTING

PURPOSE

To evaluate each contestant's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of technical drafting.

First, refer to General Regulations, Page 9.

CLOTHING REQUIREMENT

For men: Official SkillsUSA white polo shirt with black dress slacks, black socks and black leather shoes. For women: Official SkillsUSA white polo shirt with black dress slacks or skirt, black socks or black or clear seamless hose and black leather shoes. To purchase the polo shirt, contact Midwest Trophy Manufacturing Co. Inc. by calling 1-800-324-5996 or order online at www.mtmrecognition.com/skillsusa/.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

ELIGIBILITY

Open to active SkillsUSA members enrolled in programs with technical drafting as the occupational objective.

EQUIPMENT

1. Supplied by the technical committee:
   a. The technical drafting workstation will be equipped with a flat table (approximately 24"x72"), a second table with space for a personal computer and a chair
   b. 110-volt electric outlet
   c. Output hardware — plotter or printer
      1. Plotter media
      2. Pens, ink or toner as required
   d. Drafting paper/vellum

2. Supplied by the contestant:
   a. A personal computer, monitor and input devices or a laptop computer.
   b. Technical software of choice. Photocopies of software licensing for every software program used in the contest must be submitted to the technical committee at the pre-contest meeting.
   c. Machinery Handbook. (This can be in book or CD form.)
   d. Published computer-aided drafting reference books, software manuals, published technical drafting reference books, tables and calculators of your choice. Reference materials may not take up more than 1 cubic foot of space and may not be shared by contestants.
   e. One-page, typewritten résumé

COMPUTER/SOFTWARE REQUIREMENTS

Please have installed and/or set when you arrive at contest:

1. Network Configuration
   Make sure the following network components are installed:
   - Client for Microsoft Networking
   - 10/100 10-Base T Ethernet Network Interface Card (wireless not supported)
   - TCP/IP Protocol

   Do ***not*** install file and printer sharing for Microsoft networks

   Be prepared to connect to a Microsoft Windows 2000 Server domain named DOMAIN. This means your computer's workgroup name should be DOMAIN and Windows NT, Windows 2000, and Windows XP computers should have a local user named USER and USER should be a member of the LOCAL ADMINISTRATOR group. (VISTA is not supported for this contest).

   All computers (but particularly notebooks) should be prepared to connect to a WIRED 10-Base T network. VISTA is not allowed.

2. Printer Driver Information
   Please have installed: Hewlett Packard DeskJet 1220 Driver
   This driver available at www.hp.com.

3. Application Software
   Please have the latest service packs and updates applied to your application software ***before*** you get to the contest. This is your responsibility. We cannot guarantee your ability to correctly plot unless you have the latest service packs and updates applied to your application software.

4. It is advisable to bring your system software and the software you will be using for the contest in case you have setup trouble.

There will be technicians on the floor the day of setup to assist you if you need help. They will have all forms of cables, software, drivers, etc if needed. Contestants renting computers can get help at that time.

Scope of the Contest

The contest will focus on the application of appropriate technical drafting skills to solve visualization and presentation problems of a mechanical nature as designed by the national technical committee that includes: Autodesk, Big WIND, GCS Corp. and SolidWorks Corp.

Knowledge Performance

The contest will include a written knowledge exam assessing general knowledge of technical drafting. Written portions may also exist during the skills portion of the contest. Knowledge of terms and principles used in technical drafting will be required for the skill demonstration portion of the contest.

Skill Performance

The contest will assess the ability to perform technical drafting skills selected from the following list of competencies as determined by the SkillsUSA Championships technical committee.

Contest Guidelines

1. The contestants will be required to solve industry-developed problems.
2. Computer-aided drafting (CAD) technology will be used.
3. During the contest, the contestants will work independently. No assistance will be given by other contestants, instructors or observers. Limited technical assistance for computer or software malfunction may be given by appropriate manufacturer's representatives.
4. Contestants will each be given the same amount of time to accomplish the problem. Everyone will begin at the same time and take the required lunch break, and no one will be allowed to work past the contest conclusion. Note: An exception may be granted at the discretion of the technical committee in an instance where a computer/software malfunction causes a significant time loss that impacts the contestant's performance.
5. Each contestant will be responsible for establishing procedures at the computer for plotting their work to a plot file..
6. Judging criteria are general in nature and will be done from some combination of written test, plotted drawings, manual drawings and/or sketches. Specific criteria will be based on the demonstration of competency in those elements of accuracy and productivity included in the contest problem(s).

Standards and Competencies

TD 1.0 — Select the appropriate scale for the given drawing problem according to ANSI standards

1.1 Derive proper scaling and dimensions acceptable to industrial requirements on each assigned drawing

1.2 Explain the different types of scales utilized in technical drafting and how they are used for measurements

TD 2.0 — Apply sketching knowledge and techniques to solve the problem identified by the technical committee according to ANSI standards

2.1 Identify the types of sketches

2.2 Make freehand drawings to solve problems and convey ideas

2.3 Sketch to correct proportional sizes

TD 3.0 — Apply knowledge of orthographic projections to solve technical drafting problems according to ANSI standards

3.1 Explain the Theory of Orthographic Projection and how it relates to technical drafting

3.2 Draw two-dimensional orthographic projections from given three-dimensional views

3.3 Apply the principles of orthographic projection using CAD

TD 4.0 — Utilize knowledge of auxiliary views to solve technical drafting problems according to ANSI standards

4.1 Describe the true shape and size of incline and oblique surfaces in the form of "helper views" projected upon auxiliary planes

4.2 Demonstrate how and determine when to use single and double auxiliary views

TD 5.0 — Apply knowledge of sectioning to solve technical drafting problems according to ANSI standards

5.1 Explain the purpose and theory of sectioning

5.2 Describe the different types of sectioning

5.3 Represent complex interior detail by using sectioning

5.4 Represent different materials through the use of appropriate cross-hatching line symbols

TD 6.0 — Implement techniques in dimensioning and tolerancing including geometric dimensioning and tolerances to solve technical drafting problems according to ANSI standards

6.1 Define basic tolerancing terminology
6.2 Demonstrate correct dimensioning techniques and symbol applications
6.3 Explain the theory of dimensioning
6.4 Identify dimensioning styles and methods

TD 7.0 — Apply knowledge of detail and assembly drawings

7.1 Construct a detail drawing showing all necessary information
7.2 Construct an assembly drawing showing all necessary information and details

TD 8.0 — Demonstrate knowledge of fasteners and hardware

8.1 List the common types of fasteners
8.2 Draw and label fasteners correctly on production, assembly drawings and parts lists
8.3 Draw threaded fasteners using detailed and schematic representations

TD 9.0 — Demonstrate knowledge of presentation/pictorial drawings

9.1 Explain the three basic types of pictorial drawing
9.2 Make drawings that represent all three dimensions in one single view using all three types of pictorials
9.3 Apply the procedures and techniques of drawing pictorial sections and exploded views using CAD

TD 10.0 — Demonstrate knowledge of construction materials and methods

10.1 Explain use of materials and specifications for each
10.2 Explain manufacturing processes
  10.2.1 List the manufacturing processes typically used today
  10.2.2 Describe the roll quality control plays in manufacturing
10.3 Explain power transmission
10.4 Describe sheet metal developments

TD 11.0 — Utilize CAD software to create a computer-generated 3-D model and drawing

TD 12.0 — Apply reference materials and relevant mathematical formulas to assigned problems

12.1 Calculate mass properties including but not limited to volume, density and force
12.2 Calculate volume measurements from given mathematical problems
12.3 Use reference materials provided by the technical committee to effectively solve the technical drafting problem assigned to meet ANSI standards

Committee Identified Academic Skills

The technical committee has identified that the following academic skills are embedded in this contest.

Math Skills

- Use fractions to solve practical problems
- Use proportions and ratios to solve practical problems
- Simplify numerical expressions
- Solve practical problems involving percents
- Solve single variable algebraic expressions
- Measure angles
- Find surface area and perimeter of two dimensional objects
- Find volume and surface area of three dimensional objects
- Apply transformations (rotate or turn, reflect or flip, translate or slide, and dilate or scale) to geometric figures
- Construct three-dimensional models
- Apply Pythagorean Theorem
- Make comparisons, predictions, and inferences using graphs and charts
- Solve problems using proportions, formulas, and functions
- Solve problems involving symmetry and transformation
- Use measures of interior and exterior angles of polygons to solve problems
- Find arc length and the area of a sector

Science Skills

None Identified

Language Arts Skills

- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures using interviewing techniques to gain information
- Demonstrate knowledge of appropriate reference materials

Connections to National Standards

State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards

- Numbers and Operations
- Algebra
- Geometry
- Measurement
- Problem Solving
- Communication
- Connections
- Representation

Source: NCTM Principles and Standards for School Mathematics. To view high school standards, visit: standards.nctm.org/document/chapter7/index.htm. Select "Standards" from menu.

Science Standards

- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry

Source: McREL compendium of national science standards. To view and search the compendium, visit: www.mcrel.org/standards-benchmarks/.

Language Arts Standards

- Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works
- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to create, critique and discuss print and nonprint texts
- Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.

Contest Scorecard

Items Evaluated	Possible Points
Drawing Set 1	150
Drawing Set 2	150
Drawing Set 3	150
Drawing Set 4	150
Drawing Set 5	150
Interview Scores — Presentation	25
Interview Scores — Appearance	25
Title Block — Within Page	25
Title Block — Written Directions Followed	25
Written Test	150

Sub Total	**1,000**
Résumé Penalty	_____
Clothing Penalty	_____
TOTAL	_____

(All drawings will be judged on layout, dimensioning, title block data, neatness and quality. Some drawings will also be judged on weld symbols, GD&T and bill of materials.)